TEACHERS' PERCEIVED AND DESIRED ROLE IN CHILDHOOD OBESITY PREVENTION

by

Kelan D. Stanfill

A thesis submitted to the faculty of
The University of Utah
in partial fulfillment of the requirements for the degree of

Master of Science

in

Nutrition

College of Health

The University of Utah

August 2014

The University of Utah Graduate School

STATEMENT OF THESIS APPROVAL

The thesis of **Kelan D. Stanfill**

has been approved by the following supervisory committee members:

Julie Metos	, Chair	**5/9/14** Date Approved
Kristine Jordan	, Member	**5/9/14** Date Approved
Joan Benson	, Member	**5/9/14** Date Approved

and by **Julie Metos**, Chair/Dean of

the Department/College/School of **Nutrition**

and by David B. Kieda, Dean of The Graduate School.

ABSTRACT

This study examined elementary school teacher attitudes and beliefs about their perceived and desired role in childhood obesity prevention. An online survey was administered to K-6 teachers (n=628) in 55 public elementary schools in the greater Salt Lake City area. Questions addressed teachers' classroom practices, personal health behaviors, and their beliefs and attitudes about role in childhood obesity prevention. The majority of teachers (64%) believed they should play a role in childhood obesity prevention and 68% believed they can impact student health behaviors. Seventy percent of teachers included nutrition education in the classroom, with the majority (56%) teaching between 1-5 hours of nutrition lessons during the school year. On average, teachers self-reported moderate levels of nutrition self-efficacy and good to excellent overall health. Personal health practices, nutrition-self efficacy, and nutrition attitudes and beliefs were significantly correlated. Overall, teachers understood the impact of healthy nutrition practices in the classroom, but less than a quarter (21%) agreed that they have the support they need to teach nutrition in the classroom. Barriers to nutrition education include core curriculum demands, lack of time, and pressure to integrate lessons. Teachers reported the need for curriculum with short nutrition lessons, resources for nutrition guest speakers, and support for a healthy school nutrition environment.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Background

Childhood obesity rates have nearly tripled over the past three decades, increasing from 7% in 1980 to 18% in 2010.[1] Currently, one in three children ages 6-11 are considered either overweight or obese. Overweight children are at higher risk for health complications, social discrimination, and poor self-esteem. The consequences of childhood obesity include metabolic syndrome and type II diabetes in youth and increased risk for cardiovascular disease and obesity in adulthood.[1,2] Among individuals that are obese as adolescents, men are 37% and women are 51% more likely to be severely obese (BMI>40 kg/m^2) as adults.[3] Previously, obesity was thought to be an issue of excess calories and lack of physical activity; however, researchers now recognize that genetics and environmental factors are also key determinants in obesity development. Environmental factors include the types of foods available, nutrition knowledge, and the nutrition beliefs and behaviors of teachers, parents, and peers.[4] Research has shown that children are particularly susceptible to environmental factors.[5] Establishing and promoting healthy eating behaviors in childhood is one way to prevent childhood overweight and its consequences.[5]

Schools provide an opportunity to positively influence children's health behaviors because the majority of children attend school. The School Nutrition and Dietary Assessment Study III estimates that at least 35% of daily calories are consumed away from home.[6] In fact, students participating in both the school breakfast and lunch program are estimated to consume more than 50% of daily calories on school grounds.[6] Many opportunities exist to influence the food choices of students and the environment in which they consume these foods. Despite increased research regarding the obesity epidemic, there is limited evidence for the most effective way to decrease childhood obesity rates.[7]

Current Approaches in School-Based Obesity Prevention

The Centers for Disease Control and Prevention utilize the Social Ecological Model to address and understand the issues of overweight and obesity.[8] The Social Ecological Model stresses that society is comprised of interrelated elements and that these elements affect one another. The five elements of the Social Ecological Model are the individual, interpersonal, organizational, community, and society.[9] This model suggests that individual knowledge is not sufficient for behavior change; each sphere must be addressed in order to achieve effective prevention and treatment programs.[10]

Federal and state mandated nutrition policies are examples of attempts to influence the society level of the Social Ecological Model. The 2004 Child Nutrition and WIC Reauthorization Act required all educational agencies participating in the National School Lunch Program (NSLP) or child nutrition programs to establish a local school wellness policy. These policies address nutrition standards for school meals and promote

teacher practices that support a healthy school nutrition environment. A healthy school environment is one in which nutrition and physical activity are taught and supported in the classroom, the cafeteria, and throughout the school. According to the U.S. Department of Agriculture, the school nutrition environment consists of six components: nutrition education and physical activity, quality school meals, healthy snacks, pleasant eating experiences, and appropriate marketing.[11] A healthy school environment is further defined by the presence of consistent nutrition messages that promote healthy choices. While most school districts have developed wellness policies, little has been done to enforce or monitor the implementation of school wellness policies.[12] There is limited evidence to show that school wellness policies have impacted the availability of low-density foods or improved physical activity levels in schools.[13] Implementation of a school nutrition policy is shown to decrease the consumption of sugary beverages, with no demonstrated influence on the rates of childhood overweight and obesity.[14] Teachers and school administrators are generally supportive of school wellness policies, yet little effort has been made to educate teachers about its potential impact on student health behaviors.[15] Overall, researchers suggest that teachers may play a more key role in shaping the nutrition environment than previously thought.[16,17]

Teachers have the potential to influence students' eating habits through nutrition education, positive role modeling, and avoidance of unhealthy classroom food practices.[18,19] However, many teachers are not formally educated on nutrition topics and may provide inaccurate or unscientific information. Rossiter reported that 72% of prospective teachers in their final year of a degree program scored poorly when tested on basic nutrition concepts such as serving sizes and food group recommendations.[18]

Brenowitz found that teachers need to feel confident in their ability to deliver nutrition messages in order to elicit behavior change in students.[20] In addition, teachers with a higher nutrition self-efficacy spent more hours teaching nutrition in the classroom.[20]

Research on elementary school teachers' nutrition knowledge, attitudes, and practices dates back to the early 1980s. Soliah et al. found that two-thirds of teachers rarely or never talked to parents about nutritional needs or eating practices of their children.[21] While most teachers were in favor of nutrition education in schools, few actually taught it. Also, researchers found that teacher nutrition knowledge scores correlated positively with their scores on nutrition-related attitudes and practices and on nutrition education practices.[21] Similarly, Norton and colleagues found that while teachers agreed that nutrition education should be taught in the classroom, they claimed little responsibility for initiating the process.[22] Previous research indicates that teachers spend less than 10 hours a year teaching nutrition topics in the classroom.[22,23] Teachers identify the barriers to teaching nutrition in the classroom as lack of time, lack of support from school administration, lack of tools/curriculum, or the opinion that parents should be responsible for providing nutrition education.[22,23]

Strategies to address these barriers have included school-based interventions, comprehensive school wellness policies, and the development of free nutrition curriculums such as the US Department of Agriculture Team Nutrition program.[24-27] Although teachers tend to support school wellness policies, Arcan found that only one-third of teachers believed they could play an influential role in changing policies.[15] These results indicate that the majority of teachers are not included in wellness policy development, and consequently, may feel less confident in their role to implement

policies.

Efforts to involve teachers in childhood obesity prevention have centered on nutrition in-service trainings. Outcomes include an increase in hours of nutrition taught and a more positive attitude about the importance of nutrition in schools. The prevalence of nutrition in-service trainings outside of the research setting is not well-documented. Limited studies have addressed the attitudes and health behaviors of elementary school teachers and their effect on student wellness. In a prospective study, Arcan found that the majority of teachers surveyed did not believe or were uncertain that their eating behavior may influence their students' eating preferences.[15] Efforts to influence student behaviors by implementing teacher wellness programs are also limited. In the late 1990s, TeachWell, a teacher centered wellness program, showed some improvement in student health behaviors.[28] Resnicow concluded that increased participation and better program implementation would lead to more favorable results.[28] These studies suggest that teachers need to be supported in teaching nutrition education in the classroom, as well as in their own personal endeavors to improve nutrition and health habits.

Significance of Problem

Parents, teachers, administrators, nutrition staff, and other key stakeholders agree that schools have a significant and influential role in preventing childhood obesity. Furthermore, schools have a considerable level of responsibility for preventing childhood obesity, in large part because of the amount of time children spend in school and also because of the opportunities to provide healthy food options through school meal programs.[29] This theme was recurrent in a systemic review performed by Clarke et al.,

which examined 18 studies that pertained to the views of stakeholders on the role of primary schools in obesity prevention. Stakeholders generally believe that schools should have a supporting, rather than a leading role in obesity prevention. Parents should model healthy eating behaviors, encourage physical activity, and provide complete meals and schools should support these efforts. However, Massey-Sokes and Meany found that not all parents are capable of providing nutrition education in the home, especially in low-income areas. Common barriers include psychosocial issues in the home, low nutrition knowledge, and food insecurity.[30] Therefore, schools can provide a valuable educational service to both parents and children, by initiating education about healthy behaviors and physical activity.[29] While administrators can establish school-based programs and wellness policies to support this mission, teachers play an important role in supporting a healthy nutrition environment. Prior literature has provided insight on nutrition knowledge and frequency of nutrition education, but little is known about teachers' perceived and desired role in childhood obesity prevention.

Purpose of Study

The purpose of this study is to explore teacher attitudes and beliefs about the role of teachers in childhood obesity prevention.

The specific aims for the proposed study are:

1) To explore teacher attitudes and beliefs about the role of teachers in childhood obesity prevention.

2) Examine the relationship between demographics, classroom practices, and health behaviors of teachers and teachers' perceived role in obesity prevention.

CHAPTER II

METHODS

Overview

This study used survey methodology to assess self-reported classroom nutrition practices and personal health behaviors of teachers, as well as attitudes and beliefs about the role of teachers in childhood obesity prevention. The final survey instrument consisted of 36 questions covering five domains: demographics, attitudes/beliefs, classroom practices, personal health behaviors, and free response.

Sample Population

The study population consisted of a convenience sample of kindergarten through sixth grade teachers from two Utah school districts in the greater Salt Lake City, Utah metropolitan area. Of the 82 eligible elementary schools, 55 agreed to participate in the study. Only certified K-6 elementary teachers at these schools were eligible to complete the nutrition survey. Teachers in specialty areas such as music, art, resource, and speech were included in the study population. Preschool teachers, administrators, and other school personnel were excluded from the study. The original sample population included approximately 3015 certified teachers between the two school districts. The survey was

only distributed to schools that agreed to participate in the study. Approximately 2105 teachers were invited to complete the survey.

Instrument Development

The survey instrument was designed to assess classroom nutrition practices and personal health behaviors of teachers, as well as attitudes and beliefs about the role of teachers in childhood obesity prevention. Research staff developed the survey using a combination of previously validated questions and original questions.[31-33] Preliminary versions of the survey were reviewed for content validity. A convenience sample of registered dietitians and elementary school teachers (n=8) assessed the survey. The survey items were rated on the following criteria: clarity, relevance to the research question, and appropriateness for the study population. After this review, four questions were removed and wording was changed on one question. The remaining questions demonstrated appropriate content validity, as indicated by ratings of greater than 80% for each review category.[34]

The survey instrument was pilot tested with teachers (n=9) at a local elementary school to provide evidence of test-retest reliability. Teachers completed the survey twice (at baseline and two weeks later). Percent agreement was calculated by comparing pre and post responses for each teacher. Absolute reliability was 83%. Test-retest reliability was also calculated using Spearman's rho. The instrument showed strong test-retest reliability (r=0.68, range 0.35-1.0). Individual questions producing a correlation coefficient less than 0.35 were removed from the analysis.

Survey Administration

The survey was administered with RedCap, an online survey database. Once school district approval was granted, the research team contacted elementary school principals (n=82) to request their participation in the study. Principals were provided with an explanation of the research study and were encouraged to forward the survey link to certified teachers. Fifty-five schools agreed to participate in the study. Seven schools opted out of the study and twenty schools did not respond to repeated correspondence. Principals directly forwarded the survey link to certified teachers and encouraged study participation. As an incentive, $50 gift cards were awarded to ten randomly selected study participants. Participation in the study was voluntary. Teachers implied their consent by advancing to each question in the survey. Responses were anonymous and teachers were able to skip any questions they did not feel comfortable answering. The study was approved by the University of Utah Institutional Review Board for Human Subjects.

Statistical Analysis

After the close of the survey, data were analyzed using the Statistical Package for the Social Sciences (version 20.0, 2011, SPSS Inc, Armonk, NY). Univariate statistics were used to describe teachers' 1) classroom practices, 2) personal health behaviors, and 3) attitudes and beliefs about influence and role in childhood obesity. Relationships between these variables were explored using Spearman's rho correlations and chi-square tests. Comments from the free response questions were tallied and categorized into themes. Representative comments were selected to exemplify each theme. Indices were

created to represent three separate constructs: nutrition attitudes and beliefs, self-efficacy, and personal health behaviors. Reponses from Likert-type questions were summed to create the three variables. Teachers that missed or skipped an item in the index were excluded from analyses.

Development of Indices

Nutrition impact index. A four-item nutrition attitudes and beliefs index (NII) was created. Items were scored and coded with a five-point Likert-type scale, with responses ranging from 1=strongly disagree to 5=strongly agree. Responses were summed for a possible range of 4 to 20. A high score indicates a strong belief that teachers and nutrition impact a student's health and behavior. A low score indicates low belief that teachers and nutrition impact a student's performance. Cronbach's alpha for the NII was 0.74.

Nutrition self-efficacy index. A four-item self-efficacy index was (NEFI) developed. Items were scored and coded as described for the NII, with a possible score range of 4 to 20. A high score indicates high self-efficacy regarding ability to teach nutrition lessons in the classroom. A low score indicates poor nutrition self-efficacy. Cronbach's alpha for the NEFI was 0.66.

Personal health index. A previously validated series of Likert-type questions was used for the personal health index (PHI). Items were scored on a four-point Likert-type scale, with responses ranging from 1=strongly disagree to 3=strongly agree. The index was computed by summing responses to each item, with a range of 7 to 28. A low

score on the PHI represents poor self-perceived health, while a high school represents good to excellent perceived health. Cronbach's alpha for the index was 0.86.

CHAPTER III

RESULTS

Demographic Characteristics

The survey was completed by 641 participants. However, 13 surveys were excluded from data analysis due to sample exclusion criteria (preschool teachers n=7, administrators n=4, teacher aides n=2). The final sample included 628 certified K-6 elementary school teachers. The survey response rate was 30%. The response rate is similar to other studies.[16,17,23,33,35]

The majority of respondents were Caucasian (94%) and female (91%) (Table 1). Teachers were evenly distributed across all grade levels and specialty fields, and 17% worked at a Title I school. Almost one-third (30%) of teachers indicated that they have been teaching for less than five years and 28% indicated that they have been teaching for 6-10 years. More than a third (36%) held master's degrees. Half of the respondents (55%) completed at least one college-level nutrition course, 39% never completed a nutrition course, and 6% were unsure.

Table 1. Demographic characteristics of teacher participants.

Characteristic	Total	
	n	%
Gender	**624**	--
Females	570	91.3%
Males	54	8.7%
Ethnicity	**625**	
Asian/Pacific Islanders	11	1.8%
Caucasian	588	94.1%
Latino or Hispanic	15	2.4%
Native American or Aleut	2	0.3%
African American	0	0%
Other	9	1.4%
Highest level of education	**623**	
Bachelor's Degree	395	63.4%
Master's Degree	222	35.6%
Other	6	1.0%
Years teaching	**625**	
0-5 years	188	30.1%
6-10 years	173	27.7%
11-15 years	81	13.0%
16-20 years	65	10.4%
21-25 years	56	9.0%
More than 25 years	9.9%	
Number of college-level nutrition courses completed	**625**	
None	244	39%
One	222	35.5%
Two	90	14.4%
Three	14	2.2%
Four or more	17	2.7%
Unsure	38	6.1%

Nutrition Attitudes and Beliefs

While most (62%) of teachers agreed that they should play a role in childhood obesity prevention, nearly 10% disagreed or strongly disagreed and 26% were uncertain (Table 2). Reflecting their desire to play a role in obesity prevention, 80% of teachers agreed that they can make an impact in the health behaviors of students. Ninety-seven percent of teachers agreed that nutrition impacts a child's ability to learn and perform throughout the day and 95% agreed that the habits children develop now will affect their health as adults. Overall, teachers had a positive attitude about nutrition and the impact it may have on student behavior and performance.

Nutrition Self-Efficacy

The majority (68%) of teachers indicated that they can make a difference in the health behaviors of students and 70% agreed that they have the responsibility to model healthy behaviors in the classroom (Table 2). While teachers report being confident in their ability to teach nutrition lessons in the classroom, less than a quarter (21%) indicated that they have the support to include nutrition lessons in the classroom. The mean score on the nutrition-self efficacy index was 13.63 ± 2.54 (min 4, max 20) suggesting moderate levels of perceived self-efficacy.

Classroom Nutrition Practices

Teachers reported using a wide variety of rewards in the classroom. More than 55% of teachers provided candy as a reward in the classroom (Table 3). Rewards such as extra recess time, toys, school supplies, and permission for a special activity are used

Table 2. Results from Nutrition Impact Index and Self-Efficacy Index.

Nutrition Impact Index

(mean ± SD = 16.66 ± 5.01; minimum=4: maximum=20; n= 608 respondents)

	Strongly Disagree n (%)	Disagree n (%)	Uncertain n (%)	Agree n (%)	Strongly Agree n (%)
Teachers can make a difference in the health behaviors of students. (n=613)	4 (1%)	29 (5%)	86 (14%)	396 (65%)	98 (16%)
Nutrition and healthy eating can impact a child's ability to learn and perform throughout the day. (n=613)	6 (1%)	1 (0.2%)	10 (1.6%)	219 (36%)	377 (62%)
The food habits children develop now will affect their health as adults. (n=610)	11 (2%)	5 (1%)	15 (2%)	195 (32%)	384 (63%)

Self-Efficacy Index

(mean ± SD= 13.63 ± 2.54; minimum=4: maximum=20; n= 591 respondents)

	Strongly Disagree n (%)	Disagree n (%)	Uncertain n (%)	Agree n (%)	Strongly Agree n (%)
I can make a difference in the eating behaviors of my students. (n=597)	5 (1%)	35 (6%)	149 (25%)	341 (57%)	67 (11%)
I have the responsibility to model healthy eating behaviors to students in my classroom. (n=596)	9 (2%)	32 (5%)	139 (23%)	329 (55%)	87 (15%)
I have the support I need to teach nutrition lessons in the classroom. (n=599)	52 (9%)	195 (33%)	222 (37%)	103 (17%)	24 (4%)
I feel confident in my ability to teach nutrition lessons in the classroom. (n=599)	18 (3%)	111 (18%)	158 (26%)	239 (40%)	73 (12%)

Table 3. Classroom practices: Hours of nutrition education and frequency of food rewards.

Frequency of nutrition education in the classroom						
	0 hours n (%)	1-5 hours n (%)	6-10 hours n (%)	11-15 hours n (%)	16-20 hours n (%)	> 20 hours n (%)
How many hours do other professionals teach nutrition lessons in the classroom? (n=599)	411 (67%)	153 (25%)	27 (4%)	4 (< 1%)	2 (<0.5%)	2 (<0.5)
Frequency of food/candy in the classroom						
	Never n (%)	A few times a year n (%)	1-3 times a month n (%)	1-2 times a week n (%)	3-4 times a week n (%)	Daily n (%)
How often do student rewards or recognitions include food/candy in your classroom? (n=599)	35 (6%)	143 (24%)	161 (27%)	145 (24%)	63 (10%)	50 (8%)
How often do celebrations include food/candy in your classroom? (n=599)	28 (5%)	183 (30%)	351 (59%)	28 (5%)	5 (1%)	4 (1%)

equally amongst teachers. Food other than candy was rarely (16%) used as an award. Several teachers (12%) also indicated that they use a school-wide money or reward system, but did not specify the types of items that can be redeemed with the class money. Eight percent of teachers reported that food and candy are used as a reward or recognition in the classroom on a daily basis. More than a third (35%) of teachers used food as a reward between one to four times a week. Only 6% of teachers said that they never used food as a student reward or recognition. Most teachers (59%) indicated that classroom celebrations such as birthday parties and holidays involved food or candy at least one to

three times a month. Only 5% of teachers said that classroom celebrations never involved food.

More than half of teachers (56%) taught at least 1-5 hours of nutrition lessons in the classroom each year. However, nearly a third (31%) did not teach any nutrition lessons over the year and only 4% of teachers taught more than 10 hours of nutrition lessons yearly. Thirty-one percent of teachers noted that other professionals or guest speakers taught nutrition units in their classroom. Most professionals were parent volunteers (n=30), college students (n=30), or other qualified teachers (n=19). Few teachers indicated that lessons were taught by registered dietitians (n=12), school nutrition staff (n=16), or school nurses (n=12). Teachers indicated that barriers to teaching nutrition in the classroom included lack of time, too many other responsibilities, and lack of curriculum.

School Nutrition Environment

The majority of teachers (55%) agreed that their school encourages healthy nutrition practices. While only 4% of teachers felt that their school did not promote healthy practices, one-third of teachers were uncertain in their answer. Almost all respondents (80%) believe that teachers have the primary responsibility to encourage healthy food choices in the classroom. However, less than 1% of teachers felt that they have the responsibility to encourage healthy choices in the cafeteria. Teachers predominately believe that food and nutrition services (49%) and parents (36%) have the primary responsibility to encourage healthy food choices in the cafeteria. Furthermore, participation in programs that promote healthy nutrition practices widely varied. Twenty-

one percent of schools participated in the Fresh Fruit and Vegetable Program and 25% participated in a Farm to School Program. Participation in other nutrition education programs was minimal or nonexistent. In addition, nearly half (41%) of the respondents indicated that they were unaware of whether or not their school participated in nutrition education programs.

Personal Health Behaviors

Most teachers (79%) considered themselves to be in good to excellent health (Table 4). Sixty-four percent were satisfied with their eating habits and the same number considered their eating habits to be healthy. Despite an overall high average personal healthy index (mean PHI= 23.9), more than half (64%) of teachers reported inadequate exercise and 43% did not consume the recommended five servings of fruits and vegetables a day. However, almost all teachers indicated that they limit consumption of high-fat and high-sugar foods. Overall, teachers predominately agreed that their eating habits were healthy.

Relationships between Attitudes and Beliefs, Classroom Practices, and Personal Health Practices

Several weak, but significant correlations existed between selected classroom practices, nutrition attitudes and beliefs, and personal nutrition behaviors of teachers (Table 5). Nutrition self-efficacy (NSEI) was moderately correlated (r=.501) with nutrition attitudes and beliefs (NII). Total hours of nutrition lessons taught in the classroom had a weak-moderate correlation (r=.383) with NSEI and a weak moderate

Table 4. Results from Personal Health Index

Personal Health Index

(mean ± SD= 23.94 ± 5.8; minimum=8: maximum=35; n= 581 respondents)

	Strongly Disagree n (%)	Disagree n (%)	Agree n (%)	Strongly Agree n (%)
I consider myself to be in good to excellent health. (N=599)	10 (2%)	115 (19 %)	365 (58 %)	106 (17%)
I am satisfied with my own eating habits. (N=594)	14 (2%)	196 (33%)	316 (53%)	68 (12%)
I limit the amount of high-fat food items I eat. (N=593)	9 (1%)	120 (20%)	382 (65%)	82 (14%)
I limit the amount of high-sugar items I eat and drink, like candy and soft drinks. (N=592)	9 (1%)	145 (25%)	321 (54%)	117 (20%)
Most days, I eat five servings of fruits and vegetable. (N=595)	22 (4%)	239 (40%)	250 (42%)	84 (14%)
I exercise for 30 minutes a day, at least 5 days a week. (N=593)	40 (7%)	333 (56%)	145 (24%)	75 (13%)
I would classify my eating habits or diet as healthy. (N=594)	10 (2%)	181 (30%)	336 (57%)	67 (11%)

correlation (r=.371) with NII . The frequency of food and candy rewards in the classroom was not significantly correlated with NII, NSEI, PHI, or the hours of nutrition taught in the classroom. The number of years teaching was also not significantly correlated with nutrition attitudes and beliefs, self-efficacy, or the hours of nutrition taught. Interestingly, the number of years taught was weakly correlated with a slight decrease in frequency of food rewards. While the number of college-level nutrition classes completed is weakly associated with NSEI (r=.152) and PHI (r=.164), there was no association with hours of nutrition taught or frequency of food rewards.

Table 5. Relationships between attitudes and beliefs, classroom practices, and teacher health.

Bivariate Correlations							
	Nutrition Impact Index	Nutrition Self-Efficacy Index	Personal Health Index	Number of college nutrition courses	Hours of nutrition taught	Frequency of food rewards	Number of years teaching
Nutrition Impact Index	1	--	--	--	--	--	--
Nutrition Self-Efficacy Index	.501**	1	--	--	--	--	--
Personal Health Index	.180**	.295**	1	--	--	--	--
Number of college nutrition courses	.059	.170**	.164**	1	--	--	--
Hours of nutrition taught	.371**	.383**	.152**	.219**	1	--	--
Frequency of food rewards	-.012	.023	.032	.053	-.037	1	--
Number of years teaching	-.069	.072	.069	-.003	.034	-.119**	1

** Correlation is significant at the .01 level (2-tailed)

Free Response Questions

More than 400 teachers provided comments on the two open-response questions. The majority of teachers (n=115) believe that modeling positive health behaviors and setting a positive example have the biggest impact on student health (Table 6). Teachers also commented that nutrition lessons (n=78) and encouraging discussion about healthy habits (n=60) are effective ways to impact student health. Interestingly, several teachers (n=7) commented that teaching nutrition is not part of their job description and a large group of teachers (n=78) believes that parents have the primary responsibility to enforce

Table 6. Teachers' perceived influence on student health.

Theme	Example Comment
Teach nutrition lessons (n=78)	Teachers have the opportunity to talk about food and its relationship to building healthy bodies with a captive audience. Students can learn about health and nutrition in ways that parents never mention.
Model healthy behaviors or setting a positive example (n= 115)	Students look up to their teachers; what we say matters and what we do matters most. When my students see me eating/choosing fruits and vegetables, then are more likely to eat them or at least try them.
Integrate nutrition into other subjects (n=26)	We teach math every day and by high school they can do Calculus. If we taught nutrition, practiced nutrition, gave nutrition homework and dedicated as much energy to nutrition as we do to math, there would be a huge incline in health.
Change district or school policies (n=5)	They can speak with administrators and district personnel about it.
Encourage or discuss healthy habits (n=60)	We can have discussions with our students, the same way we talk to them concerning substance abuse. We can teach through example.
Stop providing candy/food as a reward (n=29)	Limiting the amount of candy/food rewards is huge. My classroom doesn't revolve around cookie or pizza parties, but rather meaningful and enjoyable activities, or out of the ordinary privileges. Food shouldn't necessarily be a reward, but rather a means to survival. Motivating kids with food, just leads to other problems in their adult years
Create a healthy nutrition environment in the classroom (n=53)	We could use rewards in our classrooms that are not food or candy - but it is difficult. Children work for candy, and it is easy to supply. For instance - my kids like longer recess, but it is difficult to set up the time and someone to be on the playground with them --- where as it is easy to let them choose a quick treat. Sometimes time plays a huge factor in nutrition. Also - it is difficult to change the mentality that cookies and cupcakes are the treat of choice for birthday celebrations.
Not part of a teacher's role (n=7)	We have the potential for great impact, but since nutrition is not on 'the test', it isn't going to happen, and until parents, legislators, and the public at large start taking responsibility for all habits of students, instead of blaming educators, educators just don't have the time or energy to do much.
Lack of time prohibits impact (n=16)	With curriculum demands already beyond what can be effectively covered in the school day, teaching has become stressful and the joy is no longer there for me and many of my colleagues. I believe that asking teachers to take on ONE MORE responsibility that should be a parent responsibility is a symptom of one of the primary problems in education and our society today.
Parents are primarily responsible (n=78)	I feel that teachers can teach about healthy food habits but it is ultimately up to the parents of the students what they put in their mouths. PARENTS are the biggest influence on what their children will eat.

healthy eating habits. Many teachers (n=65) commented that time is most important resource needed to increase nutrition education in the classroom (Table 7). Teachers also commented that they need grade-specific curriculum (n=66), access to nutrition resources (n=97), and more nutrition professionals to teach lessons (n=68).

Table 7. Resources currently used or needed to increase nutrition education in classroom..

Theme	Example Comment
Need grade-level specific curriculum (n=66)	We need grade appropriate lessons and units that are readily available with little to no preparation. When activities end early, we can teach a short nutrition lessons.
	We do not need another big binder of nutrition curriculum! We need specific, short lessons that are interactive.
Access to nutrition resources (visuals, interactive lessons, games, etc.) (n=97)	I basically have to get all the materials I use from the internet and my own research findings. Lessons with posters or other visual aids would be very helpful. And some ideas of fun activities or projects to do.
Examples of grade-level books that relate to nutrition (n=16)	I use books especially for guided reading to discuss real world topics with my students. If I had more reading material about health and nutrition, I would probably discuss it more with my students.
Interested in professional development or workshops (n=11)	Most teachers would need basic nutrition training to teach these classes.
Would teach nutrition if it were a required part of Core Curriculum (n=22)	If nutrition is not in the core curriculum, then it takes a back seat to everything else that is found in the core curriculum. Having lesson plans and supplies is helpful, but I won't even plan them into my schedule if it takes away from time spent teaching the things I am contractually obligated to teach.
More funding needed to provide healthy snack options (n=17)	Healthier treats are more expensive, so a bigger stipend each year would help me provide healthier treats/rewards.
Qualified individual should teach nutrition lessons (n=68)	We need to have the PE programs up and running in the schools again so there is someone who is specialized in this area and ready to keep kids encouraged to eat healthy and get exercise.
	I would love to have a dietician or someone else come talk to my class. Guest presenters make much more of a difference.
Ideas on integration (n=12)	We have to do argumentative and informative writing exams at the end of the year in 6th grade, so if writing could somehow be included in the nutrition education information, that would be one way I could integrate it into my teaching day and have time for it!
Need more time (n=65)	We have so little time with our students and the common core is so demanding that time is the biggest factor that precludes teaching nutrition.

CHAPTER IV

DISCUSSION AND CONCLUSION

Discussion

This study assessed nutrition attitudes and beliefs, classroom nutrition practices, and personal health behaviors of elementary school teachers. Overall, teachers agreed that they should play an active role in childhood obesity prevention. Survey respondents stated that they can positively impact the health behaviors of students through nutrition education, a supportive classroom environment, and positive role modeling. However, several barriers prevent teachers from providing sufficient nutrition education in the classroom. Barriers include poor administrative support, lack of resources, and increasing core-curriculum demands. These barriers are consistent with previous findings.[23]

Despite reported barriers, nearly all teachers in this study included at least one to five hours of nutrition instruction throughout the school year. Less than 5% of teachers taught more than 10 hours of nutrition a year. Total hours of nutrition education in this study were substantially less than the yearly average of ten to thirteen hours reported in previous studies.[22,23,36] However, results were consistent with a separate report from the Centers of Disease Control and Prevention, which found nutrition education in the elementary-school setting to be closer to 3.4 hours a year.[37]

Teachers agree that they have the primary responsibility to promote healthy food habits in the classroom, yet self-reported classroom practices are not consistent with this belief. More than half of teachers report using candy as a reward or incentive, with most teachers providing food rewards on a weekly basis. This finding is consistent with national averages.[38] Interestingly, teachers commented that the elimination of the use of candy as a reward or incentive would positively impact student health. This suggests that teachers understand that candy should not be used as a reward, but lack guidelines for easy, inexpensive, and effective alternatives. In addition to food rewards, teachers report that classroom celebrations involving food and candy occur several times a week. Prior research has shown that the typical snacks given for classroom celebrations significantly contribute to excess caloric intake.[39] Several teachers commented that while they can encourage healthy snacks in the classroom, they cannot control the types or frequency of treats that parents bring to the classroom. This suggests that guidelines for healthy celebrations may be more effective if they are school-wide policies rather than mandates by individual teachers.

Interestingly, this study found that healthy teachers were not more likely to provide nutrition education or decrease use of food rewards. Past research has suggested that healthier teachers are more effective role models and more supportive of nutrition education.[28,40] However, this study did not find a correlation between self-reported health practices and classroom nutrition practices. In fact, the majority of surveyed teachers indicated that they are in good to excellent overall health, despite failing to meet exercise and fruit and vegetable guidelines. This suggests that schools cannot rely on healthier teachers to initiate nutrition education efforts on their own. However, teachers did

provide anecdotal evidence that their personal health and eating habits can significantly impact student behaviors. In fact, most teachers felt that have the responsibility to model healthy behaviors for their students. Teachers stated that they can set a positive example by choosing healthful snacks, engaging in physical activity with students, and discussing food options in both the cafeteria and classroom. While these opportunities are not formal nutrition lessons, they serve as discussion points to reinforce healthy habits in students.

In general, teachers in this study demonstrated positive nutrition attitudes and beliefs. Most teachers understand the connection between student health habits and academic performance. In addition, teachers recognize the impact they can have on student health behaviors. However, in this study, positive nutrition attitudes and beliefs were not significantly correlated with classroom practices. This supports the idea that while teachers are supportive of nutrition education, they claim little responsibility for initiating school-based programs.[22] Interestingly, study participants were confident in their ability to teach nutrition lessons and demonstrated high-nutrition self-efficacy. Prior research has suggested that teachers with higher nutrition self-efficacy spend more hours teaching nutrition in the classroom.[20] However, results from this study did not find a correlation between nutrition self-efficacy and total hours of nutrition taught in the classroom. Overall, teachers lack the support and guidance needed to implement nutrition education and enforce healthy classroom practices.

Furthermore, it is clear that teachers feel overwhelmed by increasing pressure to meet core curriculum demands. Research suggests that the implementation of stricter academic proficiency standards has resulted in the elimination of instruction on untested subjects including nutrition education.[41] In fact, several teachers commented that lack of

time and inadequate resources prevent them from actively teaching nutrition in the classroom. Many teachers were supportive of integrating nutrition into other subject areas, but commented on the need for grade-specific curriculum that is easy to implement when time allows. Prior research has shown that a short professional development intervention can be effective in helping teachers align health and nutrition objectives with core curriculum learning standards. As a result of training, teachers showed significant changes in their self-efficacy for integrating nutrition objectives with existing core requirements.[42]

Overall, this study supports previous findings about classroom practices and nutrition education in the classroom. The study provides novel information about the relationship between personal health practices of teachers, nutrition attitudes and beliefs, and desired role in obesity prevention. Teachers were provided the opportunity to give feedback on their perceived impact and the vast majority of teachers included comments indicating widespread interest in the topic. Novel findings from this study support the need for greater teacher involvement in the development of nutrition education and obesity prevention programs.

Limitations

The current study needs to be interpreted with caution due to methodological limitations. The study included a convenience sample, which may have introduced a responder bias. Teachers that are more interested in nutrition may have been more likely to complete the survey. Furthermore, the survey link was distributed by email which may have decreased the response rate. Principals were asked to forward the link to teachers,

and only 70% of the principals confirmed that they did so. In addition, principals had to grant permission for their school to participate in the study, which may have introduced additional responder bias. Principals that did not value nutrition education may have opted out of the study, which would consequently exclude those teachers from the study. Thus, the sample population may not represent the majority of elementary schools and elementary school teachers. In addition, the study sample of teachers from the SLC metropolitan area may not be representative of teachers nationwide. Finally, the study relied on self-reported behavior practices and are subject to recall, response, and nonresponder bias.

Implications for Research and Practice

This study demonstrated that teachers are supportive of their role in childhood obesity prevention, yet are overwhelmed by demands to meet core curriculum standards. While this study shows that formal nutrition lessons are minimal, several teachers commented that they provide nutrition education in the form of positive role modeling and classroom environments that encourage healthy snack choices. Future nutrition education programs should address time limitations, as well as strategies to foster a healthy classroom environment. Teachers may be more willing to address nutrition in the classroom if the lessons are behavior-based and if they can be integrated into other subjects. Furthermore, research suggests that curriculum continuity is necessary to reinforce healthy habits from year to year.[38] Thus, school-wide initiatives are needed to improve the school nutrition environment and to provide specific guidelines for the nutrition education in the classroom. While teachers in this study self-reported a high

level of overall health, teacher and administrator wellness programs may further support efforts to model healthy nutrition and exercise practices.

Conclusion

Overall, teachers are supportive of nutrition education in the classroom and acknowledge the impact they can have on student health behaviors. However, teachers are overwhelmed by core curriculum demands and the lack the time and resources to provide nutrition education. For successful program implementation, greater teacher input is needed during the curriculum development process. Future recommendations school-based obesity programs should consider nutrition education guidelines, resources for dietitians to provide nutrition curriculum in schools, and consideration of the overall school nutrition environment.

APPENDIX

TEACHER SURVEY ON ROLE IN CHILDHOOD OBESITY PREVENTION

Confidential

Teachers' perceived and desired role in childhood obesity prevention

Purpose of the Study

The purpose of the study is to assess the attitudes, beliefs, and behaviors of teachers and their relationship to perceived role in childhood obesity prevention. Results from this study will aid researchers in developing training for teachers that further address their role in childhood obesity prevention. This study is being conducted by the Division of Nutrition at the University of Utah.

I would like to ask you to complete an on-line survey. Questions will relate to your current nutrition beliefs, attitudes and classroom practices. The risks of this study are minimal. This survey may cause you to feel uncomfortable due to potential loss of productivity. The survey takes approximately 10-15 minutes to complete.

We cannot promise any direct benefit for taking part in this survey. However we hope the information we get from this study may help benefit teachers and school administrators by more clearly defining their role in childhood obesity prevention. As an incentive, inclusion in a raffle drawing will be provided for teachers who complete the survey.

Teachers that complete the survey and enter into the raffle will be eligible to receive an online gift certificate to Amazon. Ten gift cards valued at $50 each will be raffled. Winners will be selected at random and will be notified by email.

Consent to Participate in Survey

Your data will be kept confidential. Data and records will be stored in a locked filing cabinet or on a password protected computer located in the researcher's work space. Only the researcher and members of her study team will have access to this information.

If you have questions, complaints or concerns about this study, please call Julie Metos,PhD, RD, MPH, Division of Nutrition, University of Utah, who may be reached at (801) 587-3024.

Contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu.

It should take 10-15 minutes to complete the questionnaire. Participation in this study is voluntary. You can choose not to take part and you can also choose not to finish the questionnaire or omit any question you prefer not to answer without penalty or loss of benefits.

By returning this questionnaire, you are giving your consent to participate.

Thank you for your time and interest in this study.

Demographics

What grade level do you currently teach?

- ☐ 1st grade
- ☐ 2nd grade
- ☐ 3rd grade
- ☐ 4th grade
- ☐ 5th grade
- ☐ 6th grade
- ☐ Other
- ☐ Combined

Please indicate the combined grades you teach. _____

Confidential

Please indicate the subject or area that you teach (ex. music, PE, resource, etc).

_____

Which school district do you work for?

- ☐ Salt Lake School District
- ☐ Granite School District

How many years have you been teaching?

- ☐ 0-5 years
- ☐ 5-10 years
- ☐ 10-15 years
- ☐ 15-20 years
- ☐ More than 20 years

Is your school a Title-I school?

- ☐ Yes
- ☐ No
- ☐ Unsure

What is your gender?

- ☐ Female
- ☐ Male

What is the highest degree that you have earned?

- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ Doctorate

Please indicate your ethnicity.

- ☐ African-American (non-Hispanic)
- ☐ Asian/Pacific Islanders
- ☐ Caucasian (non-Hispanic)
- ☐ Latino or Hispanic
- ☐ Native American or Aleut
- ☐ Other

Attitudes & Beliefs- School Nutrition Environment

Which of the following do you believe have the biggest impact on student nutrition and health? Please select three.

- ☐ School lunch options
- ☐ Food/treats in the classroom
- ☐ Classroom celebrations (birthdays, achievement parties, holidays, etc),
- ☐ School-wide celebrations
- ☐ Fundraisers
- ☐ Opportunities for physical activity
- ☐ School wellness policy
- ☐ Support of principal/administrative staff
- ☐ Nutrition lessons in the classroom
- ☐ Other

Who has the primary responsibility of encouraging healthy food choices in the cafeteria?

- ☐ School administration
- ☐ Food and Nutrition Services
- ☐ Parents
- ☐ Students
- ☐ Teachers
- ☐ Other

If other, please indicate who has the primary responsibility. _____

Who has the primary responsibility of enforcing healthy food choices in the classroom?

- ☐ School administration
- ☐ Food and Nutrition Services
- ☐ Parents
- ☐ Students
- ☐ Teachers
- ☐ Other

If other, please indicate who has the primary responsibility. _____

Please indicate your response to the following statements.

	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Teachers should play an active role in childhood obesity prevention.	☐	☐	☐	☐	☐
Teachers can make a difference in the health behaviors of students.	☐	☐	☐	☐	☐
Nutrition and healthy eating can impact a child's ability to learn and perform throughout the day.	☐	☐	☐	☐	☐

How often do celebrations include food/candy in your classroom?

- ☐ Daily
- ☐ 3-4 times a week
- ☐ 1-2 times a week
- ☐ 1-3 times a month
- ☐ Very infrequently
- ☐ On Special Occasions Only
- ☐ Never

What types of rewards do you provide in your classroom? Select the three most common rewards.

- ☐ Food
- ☐ Candy
- ☐ Pencils or other writing tools
- ☐ Stickers
- ☐ Toys
- ☐ Permission for a special activity
- ☐ Extra recess time
- ☐ Other

If other, please indicate the type of reward. _____

Please indicate your response to the following statements.

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
I believe that my school promotes an environment that encourages healthy nutrition practices.	☐	☐	☐	☐	☐
I believe that I can make a difference in the nutrition and physical activity behaviors of my students	☐	☐	☐	☐	☐
Children imitate my eating habits and those of others around them	☐	☐	☐	☐	☐
I have the responsibility to model healthy eating behaviors to students in my classroom	☐	☐	☐	☐	☐
I believe I am a positive role model for healthy eating habits.	☐	☐	☐	☐	☐
I believe I am a positive role model for physical activity.	☐	☐	☐	☐	☐
Overall, I consider myself in good to excellent health.	☐	☐	☐	☐	☐

Please answer the following questions about your personal health practices.

I engage in at least 30-minutes of moderate physical activity:

- ☐ Never
- ☐ Sporadically
- ☐ Once a week
- ☐ 2-3 times a week
- ☐ 4-5 times a week
- ☐ 6 or more times a week

My own approach to healthy eating could be classified as:

- ☐ Very unhealthy
- ☐ Unhealthy
- ☐ Average
- ☐ Healthy
- ☐ Very healthy

What is your height in inches? Please round to the nearest inch. (For example 5'0" = 60 inches) _____

What is your weight in pounds? _____

Please indicate your response to the following statements.

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I believe that nutrition education may alienate overweight or obese students in my class.	☐	☐	☐	☐	☐
I believe that my body size negatively impacts my ability to teach nutrition lessons in the classroom.	☐	☐	☐	☐	☐
I have the support I need to teach nutrition lessons in the classroom.	☐	☐	☐	☐	☐
I feel confident in my ability to teach nutrition lessons in the classroom.	☐	☐	☐	☐	☐
I would be willing to participate in an in-service training on ways to effectively teach nutrition in the classroom.	☐	☐	☐	☐	☐

Free Response

What impact can teachers have on changing the nutrition and health habits of students?

What tools and resources have helped or would help with increasing nutrition education in the classroom?

Would you support a teacher wellness program in your school?

Do you have any other comments or thoughts about a teacher's role in shaping the nutrition and health habits of students?

Completion of Survey & Raffle Entry

Thank you for completing our survey questions. If you would like to be entered in a raffle for a $50 gift card to Amazon please enter your e-mail address. Ten gift cards will be raffled. Your information will only be used for the raffle and for no other research or marketing purposes. Please continue to the next page to submit your survey responses.

REFERENCES

1. Biro FM, Wien M. Childhood obesity and adult morbidities. *American Journal of Clinical Nutrition.* 2010;91(5):1499-1505.

2. Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics.* 2005;115(1):22-27.

3. Suchindran C, North KE, Popkin BM, Gordon-Larsen P. Association of adolescent obesity with risk of severe obesity in adulthood. *JAMA : the journal of the American Medical Association.* 2010;304(18):2042-2047.

4. Nader PR, O'Brien M, Houts R, et al. Identifying risk for obesity in early childhood. *Pediatrics.* 2006;118(3):594-601.

5. Dietz WH, Gortmaker SL. Preventing obesity in children and adolescents. *Annual review of public health.* 2001;22:337-353.

6. Gordon AR, Cohen R, Crepinsek MK, Fox MK, Hall J, Zeidman E. The Third School Nutrition Dietary Assessment Study: background and study design. *Journal of the American Dietetic Association.* 2009;109(2 Suppl):S20-30.

7. Sobol-Goldberg S, Rabinowitz J, Gross R. School-based obesity prevention programs: A meta-analysis of randomized controlled trials. *Obesity.* 2013;21(12):2422-2428.

8. Guidelines for School Health Programs to Promote Lifelong Healthy Eating. *Journal of School Health.* 1997;67(1):9-26.

9. Bronfenbrenner U. *The Ecology of Human Development.* Cambridge, Mass: Harvard University Press 1979.

10. Lohrmann DK. A complementary ecological model of the coordinated school health program. *The Journal of school health.* 2010;80(1):1-9.

11. Gordan AF, Mary Kay; Clark, Melissa School Nutrition Dietary Assessment Study-III In: US Department of Agriculture FaNS, ed. Vol II2007.

12. Wall R, Litchfield R, Carriquiry A, McDonnell ET, Woodward-Lopez GM. Local wellness policy strength and perceived implementation of school nutrition standards across three states. *Childhood Obesity.* 2012;8(4):331-338.

13. Metos J, Murtaugh M. Words or reality: Are school district wellness policies implemented? A systematic review of the literature. *Childhood Obesity.* 2011;7(2):90-100.

14. Fung C, McIsaac JLD, Kuhle S, Kirk SFL, Veugelers PJ. The impact of a population-level school food and nutrition policy on dietary intake and body weights of Canadian children. *Preventive Medicine.* 2013.

15. Arcan C, Hannan PJ, Himes JH, et al. Intervention effects on kindergarten and first-grade teachers' classroom food practices and food-related beliefs in American Indian reservation schools. *Journal of the Academy of Nutrition and Dietetics.* 2013;113(8):1076-1083.

16. Girard BL. *Teacher Attitudes, Percieved Influences, and Self-Reported Classroom Behaviours Related to School Nutrition and Environments*, University of Southern Florida; 2010.

17. Kubik MY, Lytle LA, Hannan PJ, Story M, Perry CL. Food-related beliefs, eating behavior, and classroom food practices of middle school teachers. *Journal of School Health.* 2002;72(8):339-345.

18. Rossiter M, Glanville T, Taylor J, Blum I. School food practices of prospective teachers. *Journal of School Health.* // 2007;77(10):694-700.

19. Yager Z, O'Dea JA. The role of teachers and other educators in the prevention of eating disorders and child obesity: What are the issues? *Eating disorders.* // 2005;13(3):261-278.

20. Brenowitz N, Tuttle CR. Development and testing of a nutrition-teaching self-efficacy scale for elementary school teachers. *Journal of nutrition education and behavior.* 2003;35(6):308-311.

21. Soliah LAL, Newel GK, Vaden AG, Dayton AD. Establishing the need for nutrition education: II. Elementary teachers' nutrition knowledge, attitudes, and practices. *Journal of the American Dietetic Association.* 1983;83(4):447-453.

22. Norton PA, Falciglia GA, Wagner M. Status of nutrition education in Ohio elementary schools. *Journal of nutrition education and behavior.* 1997;29(2):92-97.

23. Stang J, Story M, Kalina B. Nutrition education in Minnesota public schools: Perceptions and practices of teachers. *Journal of nutrition education and behavior.* 1998;30(6):396-404.

24. Slawson DL, Southerland J, Lowe EF, Dalton WT, Pfortmiller DT, Schetzina K. Go Slow Whoa Meal Patterns: Cafeteria Staff and Teacher Perceptions of Effectiveness in Winning With Wellness Schools. *Journal of School Health.* 2013;83(7):485-492.

25. Sobol-Goldberg S, Rabinowitz J, Gross R. School-based obesity prevention programs: A meta-analysis of randomized controlled trials. *Obesity.* 2013.

26. Levine E, Olander C, Lefebvre C, Cusick P, Biesiadecki L, McGoldrick D. The team nutrition pilot study: Lessons learned from implementing a comprehensive school-based intervention. *Journal of nutrition education and behavior.* 2002;34(2):109-116.

27. Rosario R, Oliveira B, Araujo A, et al. The impact of an intervention taught by trained teachers on childhood overweight. *Int J Environ Res Public Health.* 2012;9(4):1355-1367.

28. Resnicow K, Davis M, Smith M, et al. Results of the TeachWell worksite wellness program. *American Journal of Public Health.* 1998;88(2):250-257.

29. Clarke J, Fletcher B, Lancashire E, Pallan M, Adab P. The views of stakeholders on the role of the primary school in preventing childhood obesity: A qualitative systematic review. *Obesity Reviews.* 2013.

30. Massey-Sokes MM, Karen S. . Understanding Our Service-Learning Community: An Exploratory Study of Parent, Teacher and Student Perceptions about Childhood Obesity. *Health Educator.* 2006;38(2):53-60.

31. Lambert LG, Carr DH. Perceptions of Elementary School Nutrition Education Practices by School Foodservice Directors, Teachers, and Principals *Journal of child nutrition & management : a publication of the American School Food Service Association.* 2006;30(1).

32. Rainville AJ, Brown DM, Choi K. Healthy school nutrition environment : results of a nationwide survey of school personnel National Food Service Management Institute; 2003.

33. Rainville AJCK, Brown, D.M. . *Healthy school nutrition environment: Results of a nationwide survey of school personnel.* 2003.

34. Carmines EG, Zeller RA. *Reliability and Validity Assessment.* SAGE Publications; 1979.

35. Lanier WA, Wagstaff RS, Demill JH, Friedrichs MD, Metos M. Teacher awareness and implementation of food and physical activity policies in utah elementary schools, 2010. *Preventing Chronic Disease.* 2012;9(1).

36. Celebuski C, Farris E. Nutrition Education in Public Elementary and Secondary Schools. 2000.

37. Kann L, Telljohann SK, Wooley SF. Health education: Results from the school health policies and programs study 2006. *Journal of School Health.* 2007;77(8):408-434.

38. *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation.* The National Academies Press; 2012.

39. Isoldi KK, Dalton S, Rodriguez DP, Nestle M. Classroom "cupcake" celebrations: observations of foods offered and consumed. *Journal of nutrition education and behavior.* 2012;44(1):71-75.

40. Hartline-Grafton HL, Rose D, Johnson CC, Rice JC, Webber LS. Are school employees role models of healthful eating? Dietary intake results from the ACTION worksite wellness trial. *Journal of the American Dietetic Association.* 2009;109(9):1548-1556.

41. *Nutrition Education in the K-12 Curriculum: The Role of National Standards: Workshop Summary.* The National Academies Press; 2013.

42. Snelling AM, Ernst J, Belson SI. Teachers as role models in solving childhood obesity. *Journal of Pediatric Biochemistry.* 2013;3(1):55-60.